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# (54) Saw blade for an electric compass saw

(57) A saw blade has a saw part 1 with toothing 2 and a clamping part 6, by which in use the saw blade is clamped by a clamping screw (11 Figure 2) between two clamping members 7, (8 Figure 2) of a clamping device of a compass saw. The clamping part 6 has a centering opening 14 and an insertion opening 16 for the clamping screw (11). The insertion opening 16 is bounded laterally by two insertion tongues 30, 31. The ratio of the width 20 of the clamping part 6, measured at right angles to the longitudinal axis of the saw blade to the length 21 lies in the range of 1 : 1 to 1 : 1.4. The ratio of the length 28 of the insertion opening 16 to its width 29 lies in the range between 1 : 0.7 and 1 : 1.1. The clamping tongues 30, 31 are each constructed with a quadrilateral shape, preferably being in the form of a rectangle. On account of this construction, the saw blade can be clamped in the clamping device without the formation of a gap. The reaction forces occurring during sawing are absorbed by the clamping tongues 30, 31 without any danger of damage and transmitted to the clamping device.

Fig.1

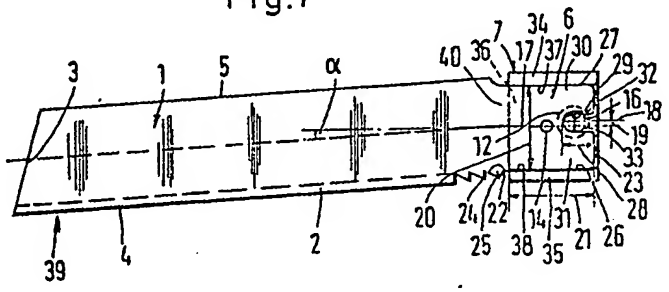


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Fig.2

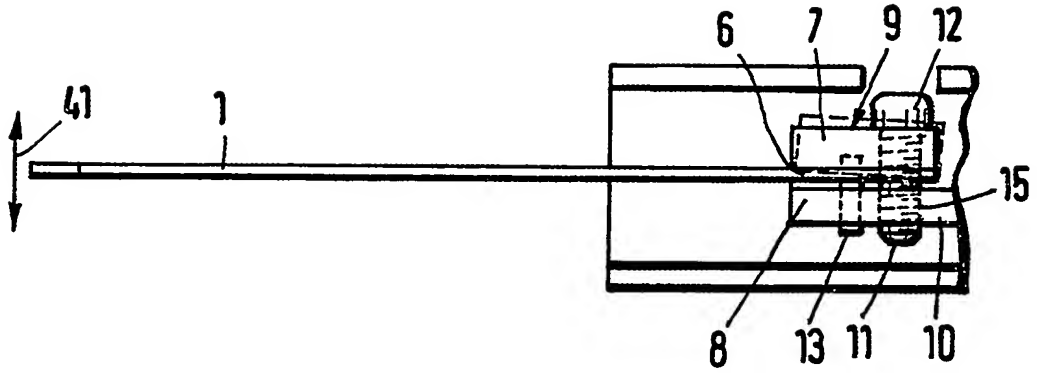
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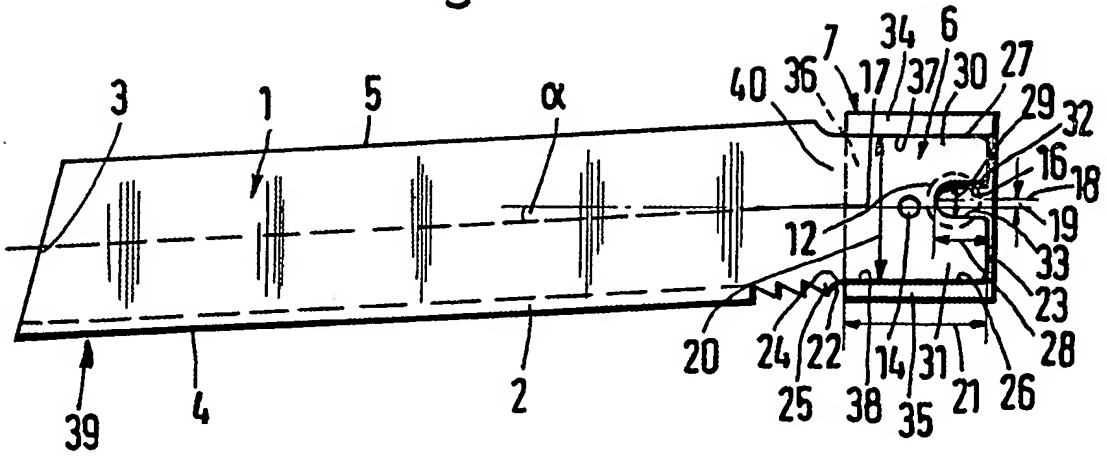
Fig.1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SPECIFICATION

**Saw blade for an electric compass saw**

The invention relates to a saw blade for an electrical compass saw which is provided on one longitudinal side with toothing and adjoining which is a clamping part by which the saw blade can be clamped by a clamping screw between two clamping members of a clamping device of the compass saw, and which comprises a centering opening and an insertion opening through which the clamping screw extends and which is bounded laterally by two clamping tongues.

In compass saws, the saw blades are placed with their clamping part between the two clamping members of the clamping device and clamped between the latter by the clamping screw. In a known saw blade (US PS 38 05 383) the clamping part is provided with a centering opening and an insertion opening. The clamping screw passes through the insertion opening and a centering pin of a lifting mechanism engages in the centering opening, by which the saw blade is moved to and fro during operation of the compass saw. The two clamping tongues, which extend in the longitudinal direction of the saw blade and form the lateral boundary of the insertion opening, are tapered in the direction of their free end. Their remote outer sides are rounded-off in the form of a partial circle, where as their facing inner sides are straight and diverge in the direction of their end face. Consequently the two clamping tongues end respectively in a point. The insertion opening for the clamping screw has only a slight depth. Seen in the axial direction of the clamping screw, the head of the clamping screw therefore projects beyond the end faces of the clamping tongues. The clamping force produced by the clamping screw by way of its head therefore does not act uniformly on the clamping part, since the head, seen in projection, projects beyond the clamping part. However, the clamping members extend so far beyond the end faces of the clamping tongues that the screw head rests completely on one clamping member. Therefore, when the clamping screw is tightened, the clamping force produced by the screw head is transmitted only partly to the clamping part. In the region in which the screw head, seen in projection, projects beyond the clamping tongues in the longitudinal direction of the saw blade, the clamping members are braced directly one against the other in this region. The result of this is that at least one clamping member tilts, so that a gap is formed between one clamping member and the saw blade at the end of the clamping device opposite the clamping screw. During sawing the saw blade consequently has a clearance at right angles to the plane of the blade, which leads to wobbling of the saw blade. It is then no longer possible to produce a clean saw cut. The danger also exists that the saw blade may break. Such a danger of breakage also exists in the region of the clamping part. The cutting pressure occurring at the time of sawing is transmitted to the clamping device, since the clamping part is supported with its remote longitudinal sides on corresponding counter-surfaces of one clamping member. However, since the clamping tongues taper to a point, their width is reduced considerably in the direction of the free end of the tongue. During sawing, one clamping tongue is subject to considerable stress. However, as a result of the reduction of its cross section, it can absorb only relatively low forces. In the case of higher stress, this clamping tongue then breaks off. Even the clamping part itself, at the transition point to the saw part, is under considerable stress during sawing. The clamping members only reach as far as this transition region, so that only the clamping part, but not the saw part is supported with respect to the cutting pressure. In the known saw blade, the clamping part is relatively narrow. As a result of the load on the saw part occurring during sawing, the saw blade therefore fractures at this transition point from the clamping part to the saw part.

Saw blades are also known which on the clamping part comprise only a single clamping tongue, the outer side of which lies in the outer side of the clamping part. With respect to the saw blade the clamping screw is arranged so that its screw head, seen in projection towards the plane of the saw blade, overlaps the clamping tongue. Since only an eccentrically located clamping tongue is provided, the saw blade is stressed even more unfavourably than saw blades which have two clamping tongues.

It is an object of the invention to provide a saw blade which facilitates trouble free clamping without the formation of a gap in the clamping device, the reaction forces occurring during sawing can be absorbed without any danger of fracture of the clamping part and/or of the clamping tongues, and the forces are transmitted to the clamping device.

The invention provides a saw blade of the aforementioned type in which the two clamping tongues extend equally in the longitudinal direction of the saw blade, wherein the ratio of the width of the clamping part, measured at right angles to the longitudinal direction of the saw blade, to the length of this clamping part, measured in the longitudinal direction of the saw blade from the end face of the clamping tongues to the end of the toothing, lies in the range of between 1 : 1 to 1 : 1.4, that the ratio of the length of the insertion opening to its width lies in the range of between 1 : 0.7 to 1 : 1.1 and that the clamping tongues are each constructed with a substantially quadrilateral shape.

predetermined dimensions of the clamping members of the clamping device, the clamping part is constructed to be so wide that it is able to absorb the reaction forces occurring during sawing reliably and to transmit them to the clamping device. In particular in the critical transition region from the clamping part to the saw part, as a result of the great width it is ensured that even in the case of high reaction forces, under which the saw part is loaded relative to the clamping part in the plane of the saw blade, there is no fracture. Despite the great width of the clamping part, it is suf-

ficiently long to be able to be clamped securely between the clamping members of the clamping device. In conjunction with the construction of the insertion opening for the clamping screw it is consequently ensured that the clamping force can be transmitted uniformly to the entire clamping part. As a result of the dimension ratios according to the invention, the insertion opening may be so long that the head of the clamping screw, seen in the projection towards the plane of the saw blade, lies completely inside the clamping part. Due to this the clamping forces are transmitted by way of one clamping member completely to the clamping part. The saw blade according to the invention is thus seated in the clamping device in a manner free from tilting. Since, seen in the projection towards the plane of the saw blade, the screw head does not project beyond the clamping part in the longitudinal direction of the saw blade, the clamping members of the clamping device may be constructed so that at one end they are flush with the end face of the clamping part. Thus, since the clamping part extends over the entire length of the clamping members, at the time of bracing, the clamping members cannot tilt with respect to each other, so that the detrimental formation of a gap between the clamping members is reliably avoided. Consequently the saw blade exhibits no tendency towards wobbling during sawing, but it is held in a trouble free manner in the clamping device, so that clean cuts can be carried out with the latter. With respect to the projection in the plane of the saw blade, a maximum degree of overlap of the screw head with the clamping part is achieved, so that at the time of bracing the clamping force exerted by the clamping members and the clamping screw is introduced uniformly into the clamping part. As a result of the relatively wide clamping part and of the correspondingly deep insertion opening, the saw blade according to the invention can be clamped in a surprisingly simple manner so that a clean saw cut can be produced without any danger of fracture of the clamping part at the transition point to the saw part. Since the two clamping tongues each have an approximately rectangular contour, they likewise have a relatively wide construction. They have no taper in the direction of their end face, so that the reaction forces occurring during sawing do not lead to bending or fracture of the clamping tongues. In conjunction with the remaining construction of the clamping part according to the invention, it is consequently ensured that high cutting forces can be applied with the saw blade according to the invention without having to fear any fracture of the clamping part and/or fracture or bending of the clamping tongues.

The invention is described in detail with reference to one embodiment illustrated in the drawings, in which:-

*Figure 1* shows a saw blade according to the invention in side view, the clamping part of which is located in a clamping member of a clamping device,

*Figure 2* is a plan view of the saw blade according to Figure 1, which is clamped in a clamping device of a compass saw.

The saw blade has a saw part 1, which is provided with toothing 2 on one longitudinal side. The saw part 1 has a substantially rectangular contour. Its end face 3 extends obliquely so that the longitudinal side 4 of the saw part 1 comprising the toothing 2 is longer than the opposing longitudinal side 5 extending parallel thereto. The toothing 4 is preferably undulating, that is to say the longitudinal edge 4 with the saw teeth extends in an undulating manner over the length of the saw part 1. The thickness of the entire saw blade 1 is in the range between approximately 1 mm and 2 mm, preferably between approximately 1.3 mm to approximately 1.7 mm.

Moreover the saw blade has a clamping part 6, by which it is clamped between two clamping members 7 and 8 of a clamping device 9. One clamping member 8 is formed by the free end of a lifting mechanism 10, which is driven by a drive (not shown) of the compass saw. The clamping member 7 is braced against the clamping member 8 by a clamping screw 11 with the interposition of the clamping part 6. A head 12 of the clamping screw 11 bears against the outer side of the clamping member 7 in the clamping position.

The end of the lifting mechanism 8 is provided with a centering pin 13, which engages in a centering opening 14 in the clamping part 6. The clamping screw 11 passes through an insertion opening 16 in the clamping part 6 by its shank 15.

The saw part 1 and the clamping part 6 lie at an angle $\alpha$ with respect to each other, which may amount for example to approximately 2 to 4°. The centering opening 14 is located half-way across the width of the clamping part 6, whereas the insertion opening 16 is offset with respect to the longitudinal axis 17 of the clamping part 6 so that the longitudinal axis 18 of the insertion opening is at a distance 19 from the axis 17 and extends parallel to the latter. In Figure 1, the width of the clamping part 6 measured at right angles to the longitudinal axis 17 is designated by the reference numeral 20. The length 21 of the clamping part is determined by the distance between the end 22 of the toothing 2 facing the clamping part and the end face 23 of the clamping part. The end 22 of the toothing 2 is formed from the transition point of the back 24 of the last saw tooth 25 remote from the end face 3 of the saw part 1 into one longitudinal side 26 of the clamping part 6. The opposite longitudinal side 27 of the clamping part 6 extends parallel to the longitudinal side 26. The end face 23 of the clamping part 6 extends perpendicular to the two longitudinal sides 26, 27. The clamping part 6 consequently has a rectangular contour. The longitudinal sides 26 and 27 pass in a curved manner into the longitudinal sides 4 and 5 of the saw part 1, which is wider than the clamping part. As shown in Figure 1, seen in the longitudinal direction of the saw blade, the saw part 1 projects beyond the clamping part 6 on both sides.

The slot-like insertion opening 16 has a maximum length 28 and width 29. The insertion open-

ing is bounded by two rectangular clamping tongues 30 and 31, which are of the same length and the remote outer sides of which are formed by the longitudinal sides 26 and 27 of the clamping part 6. The facing inner sides 32 and 33 of the clamping tongues extend parallel to each other and to the longitudinal sides 26 and 27 and pass one into the other in the form of a curve.

The clamping member 7 has a substantially U-shaped construction and comprises two sides 34 and 35, which are connected to each other by a cross-piece 36. In the clamped position, the clamping part 6 bears by its longitudinal sides 26 and 27 on the facing inner sides 37 and 38 of the sides 34 and 35 of the clamping member 7 (Figure 1). The clamping member 7 has the same length as the clamping part 6 of the saw blade, so that the end face 23 of the clamping part, which also forms the end face of the clamping tongues 30 and 31, lies in one plane with one end of the clamping member 7. Due to this the clamping part 6 bears by its entire surface against the clamping members 7 and 8 and is supported in a reliable manner. In the embodiment the clamping part 6 is approximately in the form of a square, so that the ratio between the width 20 and the length 21 of the clamping part 6 amounts to approximately 1:1. This ratio can be varied up to approximately 1:1.4. Within this range the clamping part 6 is still so wide that it can absorb the reaction torques occurring at the time of sawing without impairing the reliable clamping between the clamping members 7, 8. The preferred ratio amounts to approximately 1:1.08. It has been shown that with this ratio optimum strengths of the saw blade are achieved. The width 20 of the clamping part 6 amounts to at least approximately 20mm. It then has a high moment of resistance to bending in the plane of the saw blade. At the time of sawing the reaction force indicated by the arrow 39 occurs, which attempts to swing the saw blade about the centering pin 13. However, since the clamping part 6 is supported by its longitudinal sides 26 and 27 on the sides 34 and 35 of the clamping member 7, very high tensile stresses occur in the transition region 40 between the clamping part and the saw part 1. In saw blades, which in the case of a predetermined thickness are relatively narrow in this transition region, these tensile forces have the result that the saw part 1 breaks off from the clamping part 6 in this transition region. As a result of the reaction force 39, the clamping tongue 31 is also placed under load, which in the conventional saw blades leads to bending or even fracture of this clamping tongue. However, since this clamping tongue 31 has a rectangular contour, it has high resistance to bending. Since the insertion opening 16 is offset in the direction of the longitudinal side 27 of the clamping part 6, in relation to its length 28 the clamping tongue 31 has a great width, so that even if very high reaction forces occur, there is no danger of the clamping tongue being bent. As a result of this great width in comparison with its length, it accordingly has a very high moment of resistance to bending in the direction of the opposing clamping tongue 30. The insertion opening 16 is thus provided eccentrically in the clamping part 6 so that the clamping tongue 31 subject to bending stress at the time of sawing is wider than the other clamping tongue 30. Thus, in a surprisingly simple manner, due to the dimensions of the clamping part 6 in conjunction with the quadrilateral construction of the clamping tongue 31, the saw blade is reliably prevented from breaking or being deformed inadmissibly in the case of high reaction forces in the transition region 40 between the clamping part 6 and the saw part 1 and in the region of the clamping tongue 31. In the clamping region the saw blade is constructed so that it can absorb the high reaction forces without additional support devices.

In addition, the clamping part 6 is braced in a trouble-free manner between the two clamping members 7 and 8 by the clamping screw 11. The ratio of the length 28 of the insertion opening 16 to its width 29 lies in the range of approximately 1:0.7 to 1:1.1. The insertion opening 16 is consequently relatively deep with respect to the length 21 of the clamping part 6. Seen in the projection towards the plane of the saw blade, the screw head 12 therefore lies completely inside the clamping part 6. The screw head 12 is shown by broken lines in Figure 1. Figure 1 shows clearly that the screw head 12 does not project beyond the end face 23 of the clamping part 6. The clamping force occurring at the time of tightening of the clamping screw 11 is therefore transmitted uniformly to the clamping part 6, so that it cannot tilt between the two clamping members 7 and 8. A preferred ratio of length 28: width 29 of the insertion opening 16 amounts to approximately 1:0.85. The insertion opening 16 then has an optimum length without the width of the insertion opening leading to narrow clamping tongues. They have an adequate width in order to be able to absorb the reaction forces without bending. The width 29 of the insertion opening 16 amounts to at least approximately 6.5 mm and the length 21 of the clamping part 6 amounts to at least approximately 21.5 mm. It has been found that with these dimensions, no appreciable weakening of the clamping tongues occurs, due to which an optimum degree of overlap between the screw head 12 and clamping part 6 is achieved. In the known saw blades, the clamping tongues are substantially shorter, so that the screw head projects beyond their end faces. When the clamping screws are tightened, the clamping member 7 then tilts, as indicated in Figure 2 by a dotted line. A wedge-shaped gap is thus formed between this clamping member and the clamping part 6. As a result of this wedge-shaped gap, the saw blade is no longer guided in a trouble free manner in the clamping device 9. During sawing, it may wobble at right angles to its plane in the direction of the double arrow 41 in Figure 2. This wobbling movement of the saw blade is rellably prevented in the saw blade according to the invention, because the screw head 12 lies inside the clamping part 6, seen in the projection towards the plane of the saw blade. Since the clamping tongues 30, 31 extend as

far as the end of the clamping member 7, over the entire length of the clamping member 7, the clamping part 6 lies between the latter and the lifting mechanism 10, so that tilting of the clamping member 7 at the time of clamping is reliably prevented. In conjunction with the afore-described construction of the clamping part 6 and the clamping tongues 30, 31 it is achieved in a simple manner that the saw blade can be clamped and guided in a trouble free manner in the clamping device 9. The saw blade is characterised by a high useful life and can also be used at high cutting pressures.

CLAIMS

1. A saw blade for an electric compass saw, with a saw part which is provided on one longitudinal side with toothing and adjoining which is a clamping part, by which the saw blade can be clamped by a clamping screw between two clamping members of a clamping device of the compass saw and which comprises a centering opening and an insertion opening, through which the clamping screw extends and which is bounded laterally by two clamping tongues extending equally in the longitudinal direction of the saw blade, wherein the ratio of the width of the clamping part, measured at right angles to the longitudinal direction of the saw blade, to the length of this clamping part, measured in the longitudinal direction of the saw blade from the end face of the clamping tongues to the end of the toothing lies in the range of between 1 : 1 to 1 : 1.4, that the ratio of the length of the insertion opening to its width lies in the range of between 1 : 0.7 to 1 : 1.1 and that the clamping tongues are each constructed with a substantially quadrilateral shape.

2. A saw blade according to Claim 1, wherein the ratio of the width of the clamping part to its length is substantially 1 : 1.08.

3. A saw blade according to Claim 1 or Claim 2, wherein the ratio of the length of the insertion opening to its width is substantially 1 : 0.85.

4. A saw blade according to any one of Claims 1 to 3, wherein the length of the clamping part is at least 21.5mm.

5. A saw blade according to any one of Claims 1 to 4, wherein the width of the insertion opening is at least 6.5mm.

6. A saw blade according to any one of Claims 1 to 5, wherein the insertion opening is provided eccentrically in the clamping part so that the clamping tongue which is subjected to a bending stress during sawing is wider than the other clamping tongue.

7. A saw blade according to any one of Claims 1 to 6, wherein the width of the clamping part is at least 20 mm.

8. A saw blade according to any one of Claims 1 to 7, wherein the clamping tongues are rectangular.

9. A saw blade for an electric compass saw substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

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